

**Abstract of the Disclosure**

The charge gas from the thermal cracking of a hydrocarbon feedstock is processed in a front-end catalytic distillation hydrogenation system of an olefins plant to more effectively recover ethylene and propylene product and to process the by-products. The rate of fouling in the system is reduced by employing two columns in the system with the first column operating at a higher pressure and the second column operating at a lower pressure. The hydrogenation as well as fractionation takes place in the first column while the second column is only a fractionator. The temperature of the bottoms from each column is maintained at a temperature less than 200°C to avoid fouling.